

Claims

- [c1] An automotive actuation assembly for use in an automotive seat assembly having a seatback positionable in a plurality of seatback angles, said automotive actuation assembly comprising:
- a motion translation element pivotably mounted within said seatback, said motion translation element including a back engagement portion and a translation portion, said back engagement portion movable between a back engagement stable position and a back intrusion position, said translation portion movable from a translation stable position to a translation actuated position, said motion translation element pivoting to move said translation portion into said translation actuated position in response to said back engagement portion moving into said back intrusion position;
- a intermediary element rotatably attached to said translation portion, said intermediary element movable between an intermediary stable position and an intermediary actuated position, said intermediary element additionally movable between a disengagement position and a engagement position, said intermediary element biased towards said disengagement position;

a momentum cam assembly in communication with said intermediary element, said momentum cam assembly moving said intermediary element into said engagement position during vehicle impact, said momentum cam assembly including a biasing weight in communication with a liquid damper element, said liquid damper allowing said momentum cam assembly to adapt to the plurality of seatback angles;

a trigger arm positioned within said seatback, said trigger arm engaging said intermediary element when said intermediary element is in said engagement position, said trigger arm moving into a trigger deployed position in response to said back engagement portion entering said back intrusion position only when said intermediary element is in said engagement position; and

a seatback impact response device, said trigger arm actuating said seatback impact response device when said trigger arm moves into said trigger deployed position.

- [c2] An automotive actuation assembly as described in claim 1, the seatback including a seatback frame, said actuation assembly further comprising:

a mounting frame mounted within the seatback frame, said mounting frame positionable in a plurality of vertical locations within the seatback frame, said mounting frame including a pivot arm; and

wherein said motion translation element comprises an I-shaped element rotatably engaging said pivot arm, said pivot arm engaging said motion translation element in a position between said back engagement portion and said translation portion.

- [c3] An automotive actuation assembly as described in claim 1, wherein said motion translation element is in communication with said liquid damper such that velocity of said motion translation element moves said momentum cam assembly.
- [c4] An automotive actuation assembly as described in claim 1, wherein said momentum cam assembly comprises:
 - a rotatable cam element;
 - a cam arm comprising:
 - a horizontal arm portion mounted to said rotatable cam element; and
 - a vertical arm portion extending downwards from said horizontal arm portion;
 - a liquid damper positioned between said cam arm and said rotatable cam element such that said liquid damper allows said momentum cam assembly to adapt to the plurality of seatback angles; and
 - a biasing weight mounted to said vertical arm portion.
- [c5] An automotive actuation assembly as described in claim

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a mounting frame including cam mounting bracket, said horizontal arm portion rotatably mounted to said cam mounting bracket.

- [c6] An automotive actuation assembly as described in claim 1, wherein said seatback impact response device comprises a head restraint motion element.
- [c7] An automotive actuation assembly as described in claim 1, further comprising:
 - a rearward tubular arm mounted on mounting frame positioned within the seatback, said intermediary element rotatably engaged to said rearward tubular arm.
- [c8] An automotive actuation assembly as described in claim 6, further comprising:
 - a plurality of intermediary engagement teeth formed on said intermediary element; and
 - a plurality of trigger arm engagement teeth formed on said trigger arm, said intermediary engagement teeth engaging said trigger arm engagement teeth when said intermediary element is in said engagement position.
- [c9] An automotive actuation assembly as described in claim 8, wherein said intermediary engagement teeth and said trigger arm engagement teeth comprises uni-directional

engagement teeth.

- [c10] An automotive actuation assembly as described in claim 8, wherein said intermediary element can engage said trigger arm in a variety of positions
- [c11] An automotive actuation assembly as described in claim 1 for use in an automobile wherein said trigger arm protrudes upwards outside of said seatback.
- [c12] An automotive actuation assembly as described in claim 11, wherein said trigger arm protrudes out of the seatback and into a headrest assembly mounted to the seatback.
- [c13] An automotive seat assembly for use in an automobile comprising:
 - a seatback;
 - a motion translation element pivotably mounted within said seatback, said motion translation element including a back engagement portion and a translation portion, said back engagement portion movable between a back engagement stable position and a back intrusion position, said translation portion movable from a translation stable position to a actuated position, said motion translation element translating said translation portion into said actuated position in response to said back engage-

ment portion moving into said back intrusion position; a intermediary element rotatably attached to said translation portion, said intermediary element movable between an intermediary stable position and an intermediary actuated position, said intermediary element additionally movable between a disengagement position and a engagement position, said intermediary element biased towards said disengagement position;

a momentum cam assembly in communication with said intermediary element, said momentum cam assembly moving said intermediary element into said engagement position during vehicle impact;

a trigger arm positioned within said seatback, said trigger arm engaging said intermediary element when said intermediary element is in said engagement position, said trigger arm moving into a trigger position in response to said back engagement portion entering said back intrusion position only when said intermediary element is in said engagement position; and

a seatback impact response device, said trigger arm actuating said seatback impact response device when said trigger arm moves into said trigger position .

- [c14] An automotive seat assembly as described in claim 13 further comprising:
- a seatback frame positioned within said seatback;

a mounting frame mounted to said seatback frame, said mounting frame including a pivot arm; and wherein said motion translation element comprises an I-shaped element rotatably engaging said pivot arm, said pivot arm engaging said motion translation element in a position between said back engagement portion and said translation portion.

- [c15] An automotive seat assembly as described in claim 13, wherein said momentum cam assembly comprises:
 - a rotatable cam element;
 - a cam arm comprising:
 - a horizontal arm portion in communication with said rotatable cam element; and
 - a vertical arm portion extending downwards from said horizontal arm portion;
 - a liquid damper element positioned between said horizontal arm portion and said rotatable cam element; and
 - a biasing weight mounted to said vertical arm portion:
- [c16] An automotive seat assembly as described in claim 13, wherein said seatback impact response device comprises a head restraint motion element.
- [c17] An automotive seat assembly as described in claim 13, wherein said trigger arm protrudes out of said seatback and into a headrest assembly mounted to said seatback.

- [c18] A method of triggering an automotive seat impact response device comprising:
- rotating a motion translation element positioned within a seatback from a back engagement stable position to a back intrusion position in response to passenger intrusion into said seatback;
- moving a intermediary element from an intermediary stable position to an intermediary actuated position in response to said motion translation element moving into said back intrusion position;
- moving said intermediary element from a disengagement position to an engagement position only during vehicular impact using a momentum cam assembly in communication with the intermediary element;
- engaging a trigger arm with said intermediary element only when in said engagement position, said trigger arm moving into a trigger deployed position in response to said intermediary element moving into said intermediary actuated position;
- actuating a seatback impact response device in response to said trigger arm moving into said trigger deployed position.
- [c19] A method as described in claim 18, further comprising:
- biasing said intermediary element into said disengagement position;

moving a biasing weight suspended from a cam arm in response to vehicular impact; rotating a cam element in friction contact with said cam arm in response to the movement of said biasing weight; using said cam element to move said intermediary element from said disengagement position to said engagement position.

- [c20] A method as described in claim 18, further comprising; engaging said trigger arm with said intermediary element using a plurality of uni-directional engagement teeth.